ARCO Metals Company

Internal Correspondence

Mudge - R.M. -

Date: April 4, 1983

Subject: PLANTWIDE USE OF ARCO PETROLEUM COKE AT COLUMBIA FALLS

From/Location: T. F. Payne

To/Location: R. A. Sneddon

I. Background

ARCO coke has been used in limited amounts at Columbia Falls since 1980. A brief history of the various test phases:

Phase I: 10 pots, 1980. This test revealed a problem where dedust oil on the coke was aggravating pitch separation, causing severe anode operating problems.

Phase II: 30 pots, 1981. This test, with ARCO coke minus dedust oil, demonstrated that ARCO coke can be successfully used in a dry anode vertical stud Soderberg cell. It revealed, however, that ARCO coke could not be used in large quantities, due to insufficient coarse particles.

Phase III: 30 pots, 1982. This test was a blend of ARCO and conventional cokes, to counteract the particle size problem with ARCO coke. It gave acceptable operations, although milling problems were common, due to the hardness difference between ARCO and conventional cokes.

Phase IV: In mid-1982, Cherry Point determined that by "scalping" larger particles from the green coke feed to their calciner, they could supply adequate-sized particles for a VSS anode.

In June 1982, it was recommended that a four-month test begin with ARCO coke as the sole supply to Columbia Falls. The coke entered the anode tops in August. It takes three months in a VSS anode for the coke to arrive at the working face of the anode. In November, the appearance of the ARCO coke was accompanied by a plantwide increase in anode dusting problems.

A second four-month test was recommended, with a lowered ARCO coke real density. It was believed that lowering the real density would help alleviate the dusting problems. The second four-month period ended in March 1983. A copy of the memo recommending this second four-month test period is included as an attachment.

F. M. MUDGE

II. Summary

A. Serious anode operational problems have continued at the Columbia Falls plant. There is very strong evidence that ARCO coke is a major contributor.

B. The Columbia Falls technical and operating groups recommend that the use of ARCO coke be temporarily terminated. This is a hedge against the serious environmental and operational problems that could occur with the hot summer weather approaching.

C. Termination now will allow testing to be completed on the latest change in ARCO coke real density. In addition, a group of test pots will continue on the ARCO coke.

D. We recommend that the Corporate Anode Committee convene at Columbia Falls in June, when all the results of the ARCO coke can be evaluated.

E. Several major projects involving the future use of ARCO coke at Columbia Falls are underway. In the long run, we believe that ARCO coke will be successfully used at Columbia Falls.

III. Discussion

A. Plant Performance: The appearance of the ARCO coke at the anode face has been accompanied by serious operational problems. Table I, which follows, depicts some of the performance indicators.

1. Current Efficiency: Dropped by 1.65%, a very significant amount. This amounts to a loss in production of 30.77 lb./pot day or 6.68 million lbs./plant-year.

2. Spikes and Shatter: Increased 28%. Spikes and shatter are serious anode operating problems.

3. Pots Raked: Increased by 105%. The percentage of pots raked is the best indicator of the severity of the anode dusting problem. Even with 60% of the plant curtailed, 18 additional people have been required to rake pots.

4. Fluoride Emissions: Increased by 56%, to a point where they have been in excess of the state standard for essentially all of 1983.

5. Other Problems: The anode problems have stressed the weaker old cathodes, causing an increase in the iron impurity levels. There has been an increase in iron levels in even the newer pots due to all the raking. There has been an increase in the pot failure rate. Bath chemical additions have increased due to the extra raking. One conservative estimate of the costs associated with these carbon problems is in excess of $200,000/ month, with only two of five potlines operational.

6. Outside Influences: There may be other factors that may have influenced these performance indicators. One is that one and one-half potlines were curtailed in early February. The resultant shifting of hourly and salaried people disrupted plant operations considerably. Another is that we have had a high cut-in rate since February.

   However, the numbers reported in Table I were segregated as much as possible from these outside influences. We cannot blame ARCO coke for all our problems, but there is no doubt that operations problems with the coke are a major factor in these difficulties.

B. Phase IV Timing: Table II depicts the major events of the Phase IV test. It shows the Phase IV ARCO coke supply stopping in March with the ARCO coke continuing through the anodes until July.

   The operating and technical staff at Columbia Falls feel that this timetable is in the best interests of the plant for the following reasons:

   1. It allows the effects of low real density ARCO coke to be measured.

   2. It gets the plant back to a coke that has been successful just as the hot weather of July and August is getting underway.

      If the problems we have had during the winter continue into the hot weather, the problems could be extremely serious, as past experience has shown.

   3. If the low real density ARCO coke gives good performance, we can go back to it this summer.

   4. If not, we will know by late May. It is recommended that the Corporate Anode Committee convene in Columbia Falls in June to discuss these matters.

   5. A group of test pots will continue on the low density ARCO coke as long as is necessary.

C. Technical Questions: The fact that ARCO coke has given VSS pots operating problems while being a proven performer in prebake pots is certain to raise questions. A few comments:

   1. Corporate Anode Committee: This committee has been actively seeking the answer to these questions since 1980. Several major hurdles have been overcome. We recommend this committee continue to address this problem as a top priority.

2. Other Consultants: Sumitomo and Mitsubishi have both evaluated ARCO coke, at our request. We have worked very closely with Harvey Technical Center and the Tucson R&D group in addressing these carbon questions. The reponse from both Harvey and Tucson to our requests has always been prompt and very professional.

3. Sumitomo Technology: Columbia Falls purchased dry anode VSS technology from Sumitomo in 1976. Subsequently, nearly all VSS producers in the world have done so. Although very good in many respects, the Sumitomo technology is weak on anode composition expertise. Sumitomo's experience was based on premium pitch coke as the anode raw material. Virtually all smelters using petroleum coke have had some anode operational problems with the Sumitomo technology.

4. Mitsubishi: ARCO Metals has signed a technology exchange agreement with Mitsubishi. It appears that where Sumitomo was weak in anode composition expertise, Mitsubishi is very knowledgeable. The technology transfer will take place at Columbia Falls in May. Mitsubishi, in their evaluation of the three cokes we supplied (ARCO, Collier, and Martin-Marietta), stated that ARCO should give the best performance with their technology.

5. Other Studies: The Tucson group is currently on Phase II of an anode optimization study using ARCO coke. Phase I gave very encouraging results. Also under study is supply of an anode pitch more like that which was used when the Phase II ARCO test was underway at Columbia Falls.

IV. Conclusions

The decision to temporarily discontinue the use of ARCO coke is a difficult one. However, for the environmental and operational reasons stated in this memo, we at Columbia Falls believe it is in the best interests of this plant.

As is obvious, we as a company have spent a great deal of time, effort, and money in making ARCO coke work in a dry anode VSS operation. There are a number of major projects underway. In the long run, we believe that we will successfully use ARCO coke at Columbia Falls. We believe that is in the best interests of the corporation.

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